

Table showing for the month of December, &amp;c.—Continued.

States and stations.	Rainfall of 10 inches, or more, per month.		Rainfall of 2.50 inches, or more, in 24 hours.			Rainfall equaling or exceeding one inch per hour.			
	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
<i>Missouri.</i>		<i>Inches.</i>			<i>Inches.</i>			<i>h. m.</i>	<i>Inches.</i>
Saint Louis			1873	2-3	2.61				
<i>New Hampshire.</i>									
Mount Washington	1881	15.95							
<i>New York.</i>									
Buffalo			1878	22-23	2.53				
Oswego	1878	10.49	1878	10	2.63				
Do.			1878	10-11	2.81				
Cooper Union			1874	20	5.00				
<i>North Carolina.</i>									
Charlotte			1879	13-14	2.52				
Hatteras	1877	13.38	1877	5	2.60	1877	29	1 15	1.13
Do.	1878	10.20	1877	19	4.17				
Do.			1877	26	3.72				
Do.			1882	30	2.82				
Do.			1886	5	2.65				
Do.			1887	10	3.10				
<i>Ohio.</i>									
Kenton			1873	3-4	2.75				
Cincinnati			1873	12-13	2.75				
Do.			1880	4-5	3.10				
Do.			1883	23-24	2.60				
<i>Oregon.</i>									
Albany	1887	14.21							
Astoria	1875	19.49	1875	31	3.57				
Do.	1886	16.86	1887	6-7	3.17				
Do.	1887	16.64							
East Portland	1887	12.10							
Newport	1887	17.01							
Portland	1875	13.41	1875	30-31	3.13				
Do.	1880	13.93							
Do.	1882	20.14	1877	9-10	3.15				
Do.	1886	11.52							
Do.	1887	11.34	1881	12-13	7.66				
Roseburg			1879	4	2.86				
Do.			1883	24-25	2.50				
Do.			1884	16-17	2.53				
<i>South Carolina.</i>									
Charleston			1873	25	2.54				
Do.			1885	9-10	3.46				
Do.			1887	23-24	3.08				
Hacienda Saluda			1875	27-29	5.00				
<i>Tennessee.</i>									
Chattanooga			1879	10-11	3.10				
Do.			1880	1	3.08				
Do.			1881	21-22	3.08				

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	Year.	Amt.	Year.	Day.	Amt.	Year.	Day.	Time.	Amt.
<i>Tennessee—Continued.</i>		<i>Inches.</i>			<i>Inches.</i>			<i>h. m.</i>	<i>Inches.</i>
Knoxville			1872	19-20	3.48	1873	4	0 45	1.10
Do.						1875	26	0 30	1.03
Memphis			1884	29-30	3.09				
<i>Texas.</i>									
Clarksville	1874	10.25	1875	23	3.00				
Do.			1876	28-29	8.50				
Galveston	1887	10.28	1875	21-22	4.63	1871	28	0 20	1.36
Do.			1878	19-20	4.74	1885	12	1 15	1.02
Do.			1882	18-19	2.72				
Do.			1884	28	4.50				
Do.			1887	23-24	2.90				
Gilmer			1875	20-21	3.17				
New Ulm	1875	16.40	1875	3	5.62				
Do.			1875	21	3.12				
Do.			1875	24	2.63				
Do.			1875	31	2.75				
<i>Virginia.</i>									
Lynchburg	1884	11.81	1879	13	3.17				
Do.			1883	22	4.50				
Do.			1884	21	6.74				
Norfolk			1872	25-26	2.85				
<i>Washington.</i>									
Canby, Fort	1885	10.56	1884	18	2.77				
Do.	1886	17.35	1886	30-31	2.58				
Do.	1887	15.18							
Neah Bay	1883	11.83							
Do.	1885	13.00							
Do.	1886	30.70							
Olympia	1877	11.73	1878	1	3.60				
Do.	1879	11.42	1879	30-31	3.31				
Do.	1880	16.66	1884	18-19	3.32				
Do.	1882	10.32	1886	30-31	2.50				
Do.	1886	13.38	1887	6-7	3.82				
Do.	1887	15.75							
Pysht	1883	11.34							
Do.	1886	21.61							
Tacoma	1887	10.26							
Tatoosh Island	1883	10.45	1884	19-20	2.68				
Do.	1884	12.47	1884	20-21	2.85				
Do.	1885	10.14	1886	2-3	2.95				
Do.	1886	25.84	1886	11-12	4.02				
Do.	1887	17.47	1886	12-13	2.90				
<i>British Columbia.</i>									
New Westminster	1887	11.40							

## WINDS.

The most frequent directions of the wind during December, 1887, are shown on chart ii, by arrows flying with the wind. They were from north or northwest in the Missouri Valley, New England, the middle Atlantic, and west Gulf states; from west or southwest in the Lake region and northern slope; from north, northeast, or east in the south Atlantic and east Gulf states, and in other districts variable.

## HIGH WINDS (in miles per hour).

The maximum velocities of wind for December, 1887, at Signal Service stations where the movements are registered, are given in the table of miscellaneous meteorological data. Other than the maximum velocities given in this table, the following have been reported: Mackinaw City, Mich., 59, e., 3d. Block Island, R. I., 55, n., 3d; 58, nw., 28th. Fort Canby, Wash., 66, se., and 72, s., 4th; 72, s., 6th; 52, s., 8th; 64, s., 9th; 72, s., 11th; 56, sw., 26th. Fort Maginnis, Mont., 32, nw., 7th.

## LOCAL STORMS.

With the exception of the storm which occurred in the vicinity of Los Angeles, Cal., during the 13-14th, and that which occurred in the Indian Territory on the 18th, no well-defined local storms are reported to have occurred during December. The following are, for the most part, reports of storms which occurred in connection with some of the more important areas of low pressure, the paths of the centres of which are traced on chart i:

Fort Sully, Dak.: light and heavy snow fell alternately during the night of the 2-3d and continued throughout the following day, with high westerly winds, which reached a

maximum velocity of forty-three miles per hour. A similar storm occurred on the 31st, reaching a velocity of thirty-six miles per hour; this was the worst storm of the season, and caused the delay of trains from twenty to twenty-four hours.

Los Angeles, Cal.: a severe storm set in from the north and east at 4 a. m. on the 13th, and continued until 9.45 a. m. on the following day; the most violent part of the storm occurred between 6.30 and 9.45 a. m. on the 14th, during which time the wind blew at an average rate of thirty-six miles, the maximum velocity being fifty miles per hour. The damage in this city was slight, but reports from the surrounding country state that the storm was very destructive, especially along the line of the Sierra Madre foot-hills, where many buildings were demolished and orchards in many places were badly injured. At Crescenta Canada, a small town twelve miles north of this place, a hotel was destroyed, resulting in the death of two persons.

The "Los Angeles Herald" of the 15th contained the following in connection with the storm above referred to:

At Glendora, several cottages were blown down; no one injured. At Paquima, in the San Fernando Valley, the new hotel was almost demolished; loss \$5,000. At Lordsburg, the hotel recently erected was torn to pieces; loss \$10,000. At Rialto, three houses destroyed. At Pasadena, several houses blown down on exposed points, and quite a number of persons injured. At Cucamonga, the depot almost totally destroyed; also the new hotel and several stores and buildings; loss about \$50,000. At San Bernardino, several cottages wrecked. At San Fernando the roof of the brick warehouse was blown off and deposited on the middle of the Southern Pacific track. Between Cucamonga and Colton the cab was blown off the engine of a special eastbound freight train. At Colton the channel of the water ditch was so filled with sand which had drifted before the wind that it was impossible to obtain any water. At Riverside much damage was done in exposed districts.

Wall Street, Linn Co., Kans.: snow began falling at 2 p. m. on the 19th, and at 7.30 p. m. the storm became very severe, the wind blowing in short puffs of unusual violence, while at intervals there were perfect calms. The storm continued during the night, and at 6.15 a. m. on the 20th, with a temperature of 2° below zero, it raged with great violence; the snow drifted so that roads were impassable. The storm suddenly subsided at 6 p. m.

Los Angeles, Cal.: during the evening of the 21st a brisk northeast wind prevailed; maximum velocity twenty-four miles per hour. Reports state that in the surrounding country considerable damage was done by the wind; a number of houses were demolished in the Santa Anna Valley, and in the San Bernardino district.

Northfield, Vt.: high northeast to northwest winds prevailed during the 16th; a maximum velocity of forty miles per hour from northwest was recorded at 10.55 a. m.

Hatteras, N. C.: a gale began at 11 a. m. of the 17th, and continued during the remainder of the day; maximum velocity, forty-eight miles per hour from the west, at 8.05 p. m.

Boston, Mass.: high easterly winds prevailed from midnight of the 18th until 3.43 a. m., when a maximum velocity of fifty-six miles was recorded, after which time the wind abated.

Several newspapers published accounts of a storm which occurred during the early morning of the 17th at Armstrong Academy and Fort Washita, in the Indian Territory, near the Texas border. The following extract from the "New York Herald" of the 19th relates to this storm, which appears to have been a well-defined tornado:

LITTLE ROCK, ARK., December 18, 1887.—A special from Cove, Polk Co., reports that a destructive cyclone visited Armstrong Academy, Ind. T., Fort Washita, and Green, at an early hour on Saturday (17th) morning, causing great destruction of property and loss of life. A terrible rumbling sound was heard about five o'clock. A heavy black cloud, funnel-shaped, was seen in the distance and rapidly approaching. When about a mile north of Fort Washita it struck the ground, and from that point south for miles the work of ruin was continued. The cyclone traveled at the rate of about a mile a minute. In an

instant from the time it struck the earth half the houses in Fort Washita were in ruins. Armstrong Academy was not greatly injured, but ranches in the immediate neighborhood suffered greatly. At Green, a little hamlet six miles south of Armstrong, the damage was very heavy and many persons were injured. Seventeen houses and a general store were carried away bodily, while horses and cattle within the territory covered by the storm were killed or maimed. Two children killed at Green were carried about sixty yards by the wind and dashed to the ground, mangled so as to be almost unrecognizable. Many cattle and other stock were also killed by lightning. The storm only lasted about six minutes at any one point.

Omaha, Nebr.: northwesterly winds prevailed from 9.15 p. m. on the 19th to 11.05 p. m. on the 20th; maximum velocity, forty-two miles per hour.

Cairo, Ill.: a strong gale, accompanied by severe cold, prevailed from noon until 2 p. m. of the 20th; maximum velocity, forty-eight miles per hour.

Wood's Holl, Mass.: a maximum wind-velocity of fifty-eight miles per hour was recorded at 4.30 p. m. on the 22d. The storm began during the forenoon and ended at 9 p. m.

New London, Conn.: during the 28th the wind increased in force until it attained a maximum velocity of sixty miles per hour, and from 12.30 to 4.30 p. m. it blew steadily at the rate of forty miles per hour; after 4.38 p. m. the wind rapidly diminished. This storm is rated as among the most severe for many years; little damage, however, was done in this city.

Portland, Me.: high winds, reaching a maximum velocity of fifty-one miles per hour and accompanied by rain and snow, prevailed during the 28th. The storm was of unusual severity, causing much damage on both land and water in this vicinity.

Keeler, Cal.: a storm, during which a maximum velocity of forty miles per hour from the south was recorded, occurred on the 29th. The heavy snowfall north of this city interrupted telegraphic communication and caused the delay of trains.

Frisco, Utah: on the 29th a maximum wind-velocity of sixty-five miles per hour was recorded, and during the greater part of the day a southwesterly wind blew at the rate of from forty to fifty-eight miles per hour.

## INLAND NAVIGATION.

### ICE IN RIVERS AND HARBORS.

Hudson River.—Albany, N. Y.: floating ice on 1st, 2d, and from 17th to 22d; the river froze over on 23d, closing navigation.

The following table, showing dates of closing of navigation at this point for each season since 1867, is from the "Albany Evening Journal" of the 21st:

Year.	Navigation closed.	Year.	Navigation closed.
1867	December 8	1877	December 31
1868	December 5	1878	December 30
1869	December 9	1879	December 30
1870	November 17	1880	November 25
1871	November 29	1881	•
1872	December 9	1882	December 4
1873	November 22	1883	December 15
1874	December 12	1884	December 19
1875	December 29	1885	December 13
1876	December 2	1886	December 3

• Boats ran this winter until January 2.

The Albany "Evening Post" of the 20th states:

Only four times during the past fifty years has the Hudson River been open for uninterrupted navigation at this date. The Troy boats are still running, making regular trips to Albany and Troy. The Albany boats have stopped.

Delaware, Lehigh, and Schuylkill rivers.—Philadelphia, Pa.: navigation on the Lehigh and Schuylkill was closed on the 28th; floating ice in the Delaware on the 29th and 30th.

Lake Ontario.—Oswego, N. Y.: the steam barges "Resolute" and "Reliance" left port on the morning of the 16th, the last departures of the season.

Niagara River.—Buffalo, N. Y.: navigation closed on the 14th; the river froze on the 29th.

Presque Isle Bay.—Erie, Pa.: the bay froze over for the first time this season on the 23d.

Lake Erie.—Cleveland, Ohio: navigation closed on 15th.

Sandusky River.—Sandusky, Ohio: navigation closed on the 20th; the river froze over on the 22d.

Maumee River.—Toledo, Ohio: the last boat of the season left port on the 11th; the river froze over on the 22d.

Grand River.—Grand Haven, Mich.: the river opened on the 1st, and partially froze over again on the 29th.

Saint Clair River.—Port Huron, Mich.: navigation closed on the 10th; the river froze over on the 24th.

Thunder Bay River.—Alpena, Mich.: the river froze over and navigation closed on the 23d.

Mackinaw Strait.—Mackinaw City, Mich.: the ice broke up in the strait and moved into Lake Michigan on the 23d.

Lake Michigan.—Chicago, Ill.: navigation closed on 13th.

Little Bay de Noquet.—Escanaba, Mich.: navigation closed on the 15th; the bay froze over on the 30th.

Missouri River.—Omaha, Nebr.: the river froze on the 5th, 11th, 21st, and 28th, and opened 6th, 12th, and 23d.

Leavenworth, Kans.: the river froze on the 21st, and on the 27th loaded wagons, etc., crossed on the ice.

Mississippi River.—La Crosse, Wis.: the river was frozen throughout the month.

Dubuque, Iowa: the river froze over on the 10th.

Keokuk, Iowa: floating ice on 5th; river froze over on 22d.

Cairo, Ill.: steamers arriving on the 21st from the south bound for Saint Louis were compelled to tie up in this harbor, owing to running ice and the low stage of water in the river;